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The Triassic Mammals, Dromatherium and Microconodon.

By Henry F. Osborn, Sc. D.

(Read before the American Philosophical Society, April 15, 1887.)

The mammalian jaws discovered by Professor Emmons in the Upper Triassic beds of North Carolina, and ascribed to a single genus, *Dromatherium*, were recently examined by the writer and found to belong to separate genera. The type mandible of *Dromatherium* is preserved in the Williams College Museum, and differ widely from the mandible preserved in the Museum of the Philadelphia Academy. These differences have already been pointed out,* but require to be more fully stated, as both Professors Marsh and Cope have expressed doubts as to the distinct separation of these genera. The accompanying lithographic figures also bring out the characteristic features of these mandibles much more fully than in the pen drawings which accompanied the earlier description.

In many respects these genera agree with each other, and stand separate from the Jurassic mammals of both England and America. There is, first, a considerable diastema behind the canine, a very rare feature in the division of Mesozoic mammals to which these genera belong, although always present in the division to which *Plagianax* and its allies belong, viz., the sub-order *Multituberculata* Cope.

Dromatherium has three premolars and seven molars, but the number in *Microconodon* is quite uncertain, as only four of the series are preserved. The molars agree in one particular, which separates them widely from other Mesozoic genera, viz., in the imperfect division of the fangs. This division is indicated merely by a depression at the base of the crown, as in the genus *Dimetrodon*, among the Theromorph reptiles.

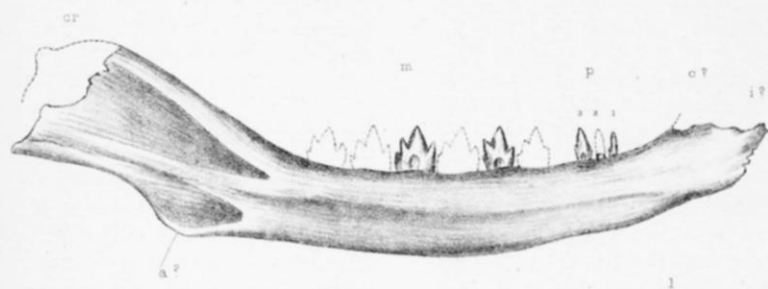
In all other respects these mandibular rami differ widely. The *Microconodon* ramus is two-thirds the length of that of *Dromatherium*; it is flattened and slender, with a nearly straight lower border beneath the molar alveoli, and a characteristic depression of the border which possibly represents the angle of the jaw as in Prof. Owen's genus *Peramus*. The coronoid process is low and the vertical diameter of the jaw at this point is very narrow. This ramus offers a great contrast to that of *Dromatherium*, which is very stout and convex with a thick lower border, projecting widely from the matrix, an elevated coronoid process and has the curvature of the lower border unbroken by any downward projection. If these differences may be given merely a specific value, and attributed in part to the fact that the *Microconodon* jaw is seen upon the outer surface, and that of *Dromatherium* upon the inner surface, let us compare closely the teeth in the two genera. Unfortunately the canine and incisors of the

* Proceedings of the Academy of Natural Sciences of Philadelphia, 1886. p. 359. I find upon a second examination of Prof. Emmons' original figure, that I did unintentionally criticise it too severely in the former article, p. 359. While far from accurate the figure is not so misleading as I at first supposed.

Microconodon ramus are wanting. We first observe that the premolars of *Dromatherium* are styloid and procumbent; if erect they would rise above the level of the molars; they have no trace of a cingulum. In the other genus the premolars are subconical and, although erect, they do not reach the level of the molar tips; they show a faint posterior cingulum, and the third premolar has the same evidence of a division of the fang which is seen in the molars, while in *Dromatherium* there is no trace of such a depression, but a distinct groove on the postero-internal face of the tooth reaching nearly to the summit. The molars of *Dromatherium* are narrow and lofty; the general pattern of the crown consists of a single main cone with a high anterior and lower posterior accessory cusp upon its slopes; but these cusps are very irregular in disposition. For example, in the second molar there are two anterior cusps; in the third molar the posterior cusp is nearly as large as the main cusp; in the fifth molar there is a trace of a postero-external cusp; in the last molar both the anterior and posterior cusps are distinctly bifid at the tip. In *Microconodon*, on the other hand, the molars are comparatively low and broad, with a low anterior and higher posterior accessory cusp; these cusps are regular and very prominent; there is also a well-marked posterior cingulum, which cannot be distinguished in the corresponding molars of the other genus.

Although the two posterior molars are wanting in *Microconodon*, the rise of the coronoid probably marks the position of the last molar; taking this estimate of the posterior point of the molar-premolar series and comparing it with the length of the series in *Dromatherium*, we find that while the ramus of one genus is only two-thirds the length of the other, the total space occupied by the molar-premolar series is very nearly the same. Estimated in another way, the molar-premolar series of *Microconodon* is a little less than one-half the entire length of the jaw ($\frac{6}{13}$), while that of the other genus is exactly one-third the length of the jaw. This discrepancy is due to the difference in the proportions of the molars; in one genus they are low and broad at the base, in the other they are unusually high and compressed.

It is difficult at present to assign any systematic position to either of these genera. *Dromatherium* is entirely unlike any known mammal, fossil or recent. The form of the molars is extremely primitive both in respect to the incomplete separation of the fangs and the remarkable variations in the number and size of the accessory molar cusps. In fact the molars appear to be in what may be called an experimental stage of structure. The accessory cusps are sometimes large and distinct, as in the third true molar; sometimes minute like needle points, as in the second molar. The incomplete separation of the fangs is a reptilian character, which correlated with the styloid premolars and recurved canine-incisor series, place *Dromatherium* very remote from any of the known Mesozoic mammals. *Microconodon*, on the other hand, is a somewhat more "recent" type, the premolars have the trace of a low posterior heel, and the molars



2b



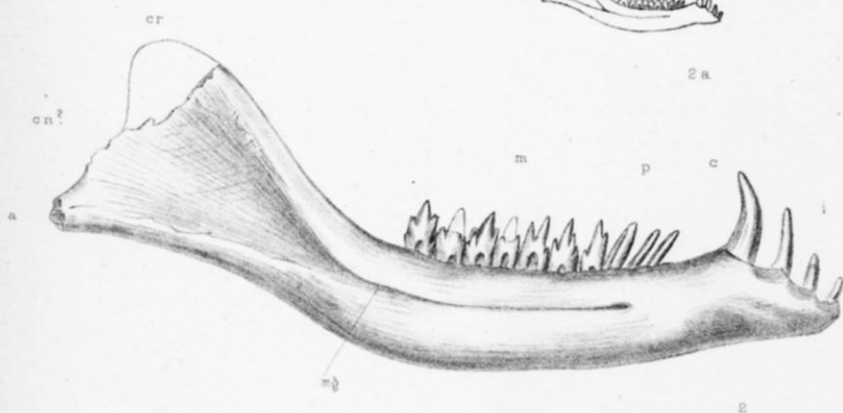
1b



1a



2a



have that regular tricuspid division of the crown which is first observed in the genus *Amphilestes* of the English Lower Jurassic and characterizes a large number of the Jurassic mammals.

EXPLANATION OF PLATE.

Figure 1. *Microconodon tenuirostris*. The outer surface of the right mandibular ramus, enlarged. The two premolars preserved are the first and third, with the fang of the second between. The space behind the third was occupied either by a fourth premolar and the first molar, or by the first and second molars. The molars preserved are, therefore, either the second and fourth, or the third and fifth. The dotted outlines are purely conjectural.

1a. The same, natural size.

1b. The fourth or fifth molar, much enlarged.

Figure 2. *Dromatherium sylvestre*. The inner surface of the left mandibular ramus, enlarged.

2a. The same, natural size.

2b. The second molar, much enlarged.

ABBREVIATIONS.

a. Angle; c. canine; cn. condyle; cr. coronoid; i. incisors; mg. mylohyoid groove; m. molars; p. premolars.

The Relation of Aerolites to Shooting Stars.

By Professor Daniel Kirkwood.

(Read before the American Philosophical Society, April 15, 1887.)

The writer more than twenty years since gave reasons for believing that shooting stars, fire balls and meteoric stones move together in the same orbits.* The facts then collected were deemed sufficient to sustain the theory advanced, or at least to give it a high degree of probability. This view has been rejected, however, by several eminent astronomers, and especially by the present Astronomer Royal for Ireland, the distinguished author of "The Story of the Heavens." He remarks: "It is a noticeable circumstance that the great meteoric showers seem never yet to have succeeded in projecting a missile which has reached the earth's surface.

* Meteoric Astr., Chap. v.